

COMBINED DECLARATION FOR PATENT  
APPLICATION AND POWER OF ATTORNEY  
(Includes Reference to PCT International Applications)

ATTORNEY'S DOCKET NUMBER

19226/830

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below)  
or an original, first and joint inventor (if plural names are listed below)  
of the subject matter which is claimed and for which a patent is sought on the invention  
entitled:

TWO-PHOTON UPCONVERTING DYES AND APPLICATIONS

the specification of which (check only one item below):

☐ is attached hereto.

☒ was filed as United States application Serial No. 08/712,143  
on September 5, 1996 and was amended under PCT Article 19 on \_\_\_\_\_  
(if applicable).

☐ was filed as PCT international application Number \_\_\_\_\_  
on \_\_\_\_\_ and was amended under PCT Article 19 on \_\_\_\_\_  
(if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified  
specifications, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of  
this application in accordance with Title 37, Code of Federal Regulations, § 1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 of any  
foreign application(s) for patent or inventor's certificate or of any PCT international  
application(s) designating at least one country other than the United States listed below  
and have also identified below any foreign application(s) for patent or inventor's  
certificate or any PCT international application(s) designating at least one country other  
than the United States of America filed by me on the same subject matter having a filing  
date before that of the application(s) of which priority is claimed:

PRIOR FOREIGN/PCT APPLICATION(S) AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. 119:

COUNTRY (IF PCT, indicate "PCT")	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 35 USC 119
US	60/003,296	06 SEPT 1995	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
US	60/005,924	27 OCT 1995	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
US	60/010,330	15 DEC 1995	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
US	To be assigned	27 AUG 1996	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States  
application(s) or PCT international application(s) designating the United States of  
America that is/are listed below and, insofar as the subject matter of each of the claims  
of this application is not disclosed in that/those prior application(s) in the manner  
provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the  
duty to disclose material information as defined in Title 37, Code of Federal Regulations,  
§ 1.56(a) which occurred between the filing date of the prior application(s) and the  
national or PCT International filing date of this application:

PRIOR U.S. APPLICATIONS OR PCT INTERNATIONAL APPLICATIONS DESIGNATING THE U.S. FOR BENEFIT  
UNDER 35 U.S.C. 120:

U.S. APPLICATIONS		STATUS (Check One)		
U.S. APPLICATION NUMBER	U.S. FILING DATE	PATENTED	PENDING	ABANDONED
PCT APPLICATIONS DESIGNATING THE U.S.				
PCT APPLICATION NO.	PCT FILING DATE	U.S. SERIAL NUMBERS ASSIGNED (if any)		

COMBINED DECLARATION FOR PATENT APPLICATION  
AND POWER OF ATTORNEY (Continued)

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POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. Peter Rogalskyj, Reg. No. 38,601; Michael L. Goldman, Reg. No. 30,727.

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COMBINED DECLARATION FOR PATENT APPLICATION  
AND POWER OF ATTORNEY (Continued)

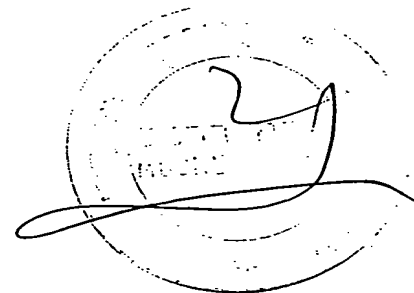
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2 0 9	FULL NAME OF INVENTOR	FAMILY NAME Pan	FIRST GIVEN NAME Shan	SECOND GIVEN NAME Jen
	RESIDENCE & CITIZENSHIP	CITY Amherst	STATE/FOREIGN COUNTRY New York	COUNTRY OF CITIZENSHIP China
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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statement may jeopardize the validity of the application or any patent issuing thereon.

SIGNATURE OF INVENTOR 201 <i>Pan Shan</i>	SIGNATURE OF INVENTOR 202 <i>Shan Pan</i>	SIGNATURE OF INVENTOR 203 <i>Guo S. He</i>
DATE <i>Dec 16/96</i>	DATE <i>Dec. 10/12/96</i>	DATE <i>10/12/96</i>
SIGNATURE OF INVENTOR 204	SIGNATURE OF INVENTOR 205 <i>Ray Fung</i>	SIGNATURE OF INVENTOR 206 <i>Y. H. Li</i>
DATE	DATE <i>30/10/1996</i>	DATE <i>12/10/96</i>
SIGNATURE OF INVENTOR 207	SIGNATURE OF INVENTOR 208 <i>Y. A. G.</i>	SIGNATURE OF INVENTOR 209 <i>Y. A. G.</i>
DATE	DATE <i>10/Dec. 1996</i>	DATE <i>10/Dec. 1996</i>



COMBINED DECLARATION FOR PATENT APPLICATION  
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	RESIDENCE & CITIZENSHIP	CITY Amherst	STATE/FOREIGN COUNTRY New York	COUNTRY OF CITIZENSHIP China
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SIGNATURE OF INVENTOR 204 <i>Changfeng Zhao</i>	SIGNATURE OF INVENTOR 205 <i>Ray</i>	SIGNATURE OF INVENTOR 206 <i>Ray</i>
DATE 11/27/96	DATE 30/10/1996	DATE 12/10/96
SIGNATURE OF INVENTOR 207	SIGNATURE OF INVENTOR 208 <i>Ray</i>	SIGNATURE OF INVENTOR 209 <i>Ray</i>
DATE	DATE 10 Dec. 1996	DATE 10/Dec/96

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COMBINED DECLARATION FOR PATENT APPLICATION  
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2 0 9	FULL NAME OF INVENTOR	FAMILY NAME Pan	FIRST GIVEN NAME Shan	SECOND GIVEN NAME Jen
	RESIDENCE & CITIZENSHIP	CITY Amherst	STATE/FOREIGN COUNTRY New York	COUNTRY OF CITIZENSHIP China
	POST OFFICE ADDRESS	P.O. ADDRESS 261 Travers Circle, #D	CITY Amherst	STATE/ZIP CODE/COUNTRY New York/14228/U.S.A.

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SIGNATURE OF INVENTOR 201 <i>Pan Sh. Jen</i>	SIGNATURE OF INVENTOR 202 <i>Shan Jen</i>	SIGNATURE OF INVENTOR 203 <i>Emily S. He</i>
DATE Dec 16 1996	DATE 10/12/96	DATE 10/12/96
SIGNATURE OF INVENTOR 204	SIGNATURE OF INVENTOR 205 <i>Raj F. H.</i>	SIGNATURE OF INVENTOR 206 <i>B. R. L.</i>
DATE	DATE 30/10/1996	DATE 12/10/96
SIGNATURE OF INVENTOR 207 <i>J. S. H.</i>	SIGNATURE OF INVENTOR 208 <i>V. A. L.</i>	SIGNATURE OF INVENTOR 209 <i>S. J. A. P.</i>
DATE 11/15/96	DATE 10 Dec 1996	DATE 10/Dec/96

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## **TWO-PHOTON UPCONVERTING DYES AND APPLICATIONS**

This application claims the benefit of U.S. Provisional Patent Application Serial No. 60/003,296, filed September 6, 1995; U.S. Provisional Patent Application Serial No. 60/005,924, filed October 27, 1995; U.S. Provisional Patent Application Serial No. 60/010,330, filed December 15, 1995; and U.S. Provisional Patent Application having unknown serial number, filed August 27, 1996 by Express Mail No. EM363285418US, bearing attorney's docket number 19226/800, identifying Paras N. Prasad, Jayant D. Bhawalkar, Ping Chin Cheng, and Shan Jen Pan as joint inventors and entitled "Three-Dimensional Data Storage".

This invention was made through the support of the Air Force Office of Scientific Research (Grant No. F49620-91-0053); the Air Force Office of Scientific Research and the Polymer Branch of the Air Force Wright Laboratory (Grant Nos. F49620-93-C0017 and F33615-94-C-5803); and the U.S. Air Force Office of Scientific Research/BMDO (Grant No. F49620-94-10335). The Federal Government may retain certain rights in the invention.

### **FIELD OF THE INVENTION**

The present invention relates to styryl dyes and compositions and to methods for using these dyes and compositions; to porous glass-polymer composites and to methods for using these composites; to methods and compositions for generating singlet oxygen and for killing cells and viruses; and to methods and media for storing and reading data generally and, more particularly, for reading and storing data in three dimensions.

### **BACKGROUND OF THE INVENTION**

#### **Frequency Upconversion**

Frequency upconversion lasing is an important area of research and has become more interesting and promising in recent years. Compared to other coherent frequency upconversion techniques, such as optical harmonic generation or sum frequency mixing based on second- or third-order nonlinear optical processes, the major advantages of upconversion lasing techniques are: i) elimination of phase-matching requirements, ii) feasibility of using semiconductor lasers as pump sources, and iii) capability of adopting waveguide and fiber configurations. To date, two major technical approaches have been used to achieve frequency upconversion lasing: one is based on direct two-photon (or multi-photon) excitation of a gain medium (two-photon